



AMENDMENTS TO THE CLAIMS

It 1. (currently amended) A system for bulge forming an unheated a substantially flat blank into an article which comprises a formed part and which includes a shaped portion, comprising:

8
6- a form-shaping ~~an~~ element for enabling the shaped portions of the article to be formed thereagainst, including a complementary portion which is complementary in shape to the shape of the shaped portion of the article to be formed thereby;

9
an enclosing enabling ~~element~~ ~~means~~ for enabling the form-shaping element to be enclosed therein, and for enabling the unheated blank to be positioned and enclosed therein;

A
a flexible member, adapted to be enclosed within the enclosing enabling element ~~means~~, to bulge within the enclosing enabling element ~~means~~ upon the application of pressure to the flexible member, to exert pressure on the unheated blank adapted to be positioned in the enclosing enabling element ~~means~~, and to bend the unheated blank relative to the form-shaping element complementary portion to form the shaped portion of the article; and

12
an expansion enabling ~~element~~ ~~means~~ for enabling expansion of the flexible member so as to exert pressure on the unheated blank and form the shaped portion of the article against the form-shaping element.

RECEIVED

AUG 04 2003

TECHNOLOGY CENTER R3/06

It 2. (currently amended) The system of claim 1, wherein the flexible member is further adapted to be attached within the enclosing enabling element ~~means~~.

It 3. (currently amended) The system of claim 1, wherein the flexible member is further adapted to be movable within the enclosing enabling element ~~means~~.

It 4. (original) The system of claim 1, wherein the flexible member comprises a bladder.

It 5. (original) The system of claim 1, wherein the form-shaping element comprises a die element.

A O 6. (currently amended) The system of claim 1, wherein the enclosing enabling element ~~means~~ comprises a plurality of inter-engagable cage sections, adapted to be secured together to enable the article shaped portion to be formed therein, and to be separated to enable the unheated blank to be inserted therein or to enable removal of the article formed therein.

It 7. (currently amended) The system of claim 1, wherein the expansion enabling element ~~means~~ comprises a ¹²pumping enabling element ~~means~~ for enabling a medium for exerting pressure on the flexible member to be pumped therethrough into the flexible member for expansion of the flexible member.

It 8. (currently amended) The system of claim 1, wherein the unheated blank is comprised of sheet metal.

O 9. (original) The system of claim 1, further comprising a plurality of form-shaping elements, and a plurality of flexible members.

It
103
relative

10. (original) The system of claim 1, wherein the article in which a shaped portion is to be bulge formed comprises a substantially large article.

It

11. (original) The system of claim 1, wherein the article further comprises a finished part.

It
relative

12. (original) The system of claim 1, wherein the article is comprised of lightweight material.

It
1

13. (original) The system of claim 1, wherein the article comprises a complex shaped article, which includes a plurality of shaped portions.

A
It 103

14. (original) The system of claim 4, wherein the bladder is comprised of rubber.

It 103

15. (original) The system of claim 4, wherein the bladder is comprised of polyurethane.

It

16. (currently amended) The system of claim 7, wherein the pumping enabling element ~~means~~ includes a tube, adapted to be connected to the flexible member.

It 103

17. (original) The system of claim 7, wherein the pressure-exerting medium comprises hydraulic fluid.

It 103
obvious

18. (currently amended) The system of claim 8, wherein the unheated sheet metal blank is comprised of aluminum.

It's free
claiming
tool not
product

19. (original) The system of claim 10, wherein the article comprises an aircraft fuselage crown frame.

20. (original) The system of claim 10, wherein the article to be formed thereby
|| further comprises a thin-walled article.

21. (original) The system of claim 10, wherein the article to be formed thereby
|| further comprises a structural article.

22. (currently amended) The system of claim 10, wherein the unheated blank
|| to be formed into the article is substantially large corresponding to the substantially large
(article.

A
It's relative
to heat

23. (currently amended) The system of claim 10, wherein the enclosing
enabling element means, the form shaping element, and the flexible member are
substantially large corresponding to the substantially large article.

inherent
It

24. (original) The system of claim 16, wherein the tube comprises a flexible
tube.

25. (currently amended) A system for bulge forming an unheated a
substantially flat blank into an article which comprises a formed part and which includes
a shaped portion, comprising:

a form-shaping 6 means ~~element~~ for enabling the shaped portions of the
article to be formed there against, including a complementary portion which is

7
complementary in shape to the shape of the shaped portion of the article to be formed thereby;

9
an enclosing enabling means ~~element~~ for enabling the form-shaping means ~~element~~ to be enclosed therein, and for enabling the unheated blank to be positioned and enclosed therein;

A
a flexible member, adapted to be enclosed within the enclosing enabling means, to bulge within the enclosing enabling means ~~element~~ upon the application of pressure to the flexible member, to exert pressure on the unheated blank adapted to be positioned in the enclosing enabling means ~~element~~, and to bend the unheated blank relative to the form-shaping element complementary portion to form the shaped portion of the article; and

12
an expansion enabling means ~~element~~ for enabling expansion of the flexible member so as to exert pressure on the unheated blank and form the shaped portion of the article against the form-shaping element.

It 26. (currently amended) The system of claim 25, wherein the flexible member is further adapted to be attached within the enclosing enabling means ~~element~~.

It 27. (currently amended) The system of claim 25, wherein the flexible member is further adapted to be movable within the enclosing enabling means ~~element~~.

It 28. (original) The system of claim 25, wherein the flexible member comprises a bladder.

It 29. (original) The system of claim 25, wherein the form-shaping element comprises a die element.

Ob 30. (currently amended) The system of claim 25, wherein the enclosing enabling means comprise ~~element comprises~~ a plurality of inter-engagable cage sections, adapted to be secured together to enable the article shaped portion to be formed therein, and to be separated to enable the unheated blank to be inserted therein or to enable removal of the article formed therein.

A It 31. (currently amended) The system of claim 25, wherein the expansion enabling means comprise ~~element comprises~~ ¹² pumping enabling means ~~an element~~ for enabling a medium for exerting pressure on the flexible member to be pumped therethrough into the flexible member for expansion of the flexible member.

It 32. (currently amended) The system of claim 25, wherein the unheated blank is comprised of sheet metal.

Ob 33. (original) The system of claim 25, further comprising a plurality of form-shaping elements, and a plurality of flexible members.

It 34. (original) The system of claim 25, wherein the article in which a shaped portion is to be bulge formed comprises a substantially large article.

It 35. (original) The system of claim 25, wherein the article further comprises a finished part.

36. (original) The system of claim 25, wherein the article is comprised of

+ treat
It lightweight material.

37. (original) The system of claim 25, wherein the article comprises a complex

+ treat
It shaped article, which includes a plurality of shaped portions.

38. (original) The system of claim 28, wherein the bladder is comprised of

103
+ treat
rubber.

39. (original) The system of claim 28, wherein the bladder is comprised of

103 + treat
polyurethane.

40. (currently amended) The system of claim 31, wherein the pumping

A
inherent
It enabling means include ~~element includes~~ a tube, adapted to be connected to the flexible member.

41. (original) The system of claim 31, wherein the pressure-exerting medium

103
+ treat
comprises hydraulic fluid.

42. (currently amended) The system of claim 32, wherein the sheet metal

It
+ treat unheated blank is comprised of aluminum.

43. (original) The system of claim 34, wherein the article comprises an aircraft

It
+ treat fuselage crown frame.

44. (original) The system of claim 34, wherein the article to be formed thereby
treat
It further comprises a thin-walled article.

45. (original) The system of claim 34, wherein the article to be formed thereby
treat
It further comprises a structural article.

46. (currently amended) The system of claim 34, wherein the unheated blank
treat
It ~~sheet metal~~ to be formed into the article is substantially large corresponding to the
substantially large article.

47. (original) The system of claim 34, wherein the enclosing enabling means,
treat
It the form-shaping element, and the flexible member are substantially large corresponding
to the substantially large article.

48. (original) The system of claim 40, wherein the tube comprises a flexible
treat
It tube.

method
49. (currently amended) A method of bulge forming an unheated a
substantially flat blank into an article which comprises a formed part and which includes
a shaped portion, in a system which comprises a form-shaping an element for enabling
the shaped portions of the article to be formed thereagainst, including a complementary
portion which is complementary in shape to the shape of the shaped portion of the article
to be formed thereby, an enclosing enabling element means for enabling the form-
shaping element to be enclosed therein, and for enabling the unheated blank to be
positioned and enclosed therein, a flexible member, adapted to be enclosed within the

enclosing enabling element means, to bulge within the enclosing enabling means upon the application of pressure to the flexible member, to exert pressure on the unheated blank adapted to be positioned in the enclosing enabling element means, and to bend the unheated blank relative to the form-shaping element complementary portions to form the shaped portion of the article, and an expansion enabling element means for enabling expansion of the flexible member so as to exert pressure on the unheated blank and form the shaped portion of the article against the form-shaping element, wherein the method comprises:

A¹ opening the enclosing enabling element means and positioning the unheated blank therein relative to the form-shaping element;

II closing the enclosing enabling element means; and

expanding the flexible member such that the flexible member bulges relative to the unheated blank and exerts pressure on the unheated blank against the form-shaping ~~enabling~~ element to form the shaped portion of the article.

II⁺ 50. (currently amended) The method of claim 49, wherein the flexible member is further adapted to be attached within the enclosing enabling element means, and wherein expanding comprises exerting pressure from the attached flexible member within the enclosing enabling element means.

It 51. (currently amended) The method of claim 49, wherein the flexible member is further adapted to be movable within the enclosing enabling element ~~means~~, and wherein expanding comprises exerting pressure from the moveable flexible member within the enclosing enabling element ~~means~~.

It 52. (original) The method of claim 49, wherein the flexible member comprises a bladder, and wherein expanding comprises expanding the bladder.

A It 53. (original) The method of claim 49, wherein the form-shaping element comprises a die element, and wherein expanding comprises expanding the flexible member against the die element.

Ob 54. (currently amended) The method of claim 49, wherein the enclosing enabling element ~~means~~ comprises a plurality of inter-engagable cage sections, adapted to be secured together to enable the article shaped portion to be formed therein, and to be separated to enable the unheated blank to be inserted therein or to enable removal formed therein, and wherein closing the enclosing enabling element ~~means~~ comprises engaging together the sections of the enclosing enabling element ~~means~~.

55. (currently amended) The method of claim 49, wherein the expansion enabling element means comprises ¹² a pumping enabling element means for enabling a medium for exerting pressure in the flexible member to be pumped therethrough into the flexible member for expansion of the flexible member, and wherein expanding comprises enabling the pressure exerting medium to be pumped through the pumping enabling element means into the flexible member for expansion of the flexible member.

56. (currently amended) The method of claim 49, wherein the unheated blank ~~It~~ is comprised of sheet metal, and wherein expanding comprises expanding the flexible member against the unheated sheet metal blank.

57. (original) The method of claim 49, further comprising a plurality of form-shaping elements, and a plurality of flexible members, and wherein expanding comprises expanding the plurality of flexible members against the plurality of form-shaping elements.

58. (original) The method of claim 49, wherein the article in which a shaped portion is to be bulge formed comprises a substantially large article, and wherein ~~It~~ expanding further comprises forming the substantially large article.

59. (original) The method of claim 49, wherein the article further comprises a finished part, and wherein expanding further comprises forming the finished part.

60. (original) The method of claim 49, wherein the article is lightweight, and wherein expanding further comprises forming the lightweight article.

61. (original) The method of claim 49, wherein the article comprises a complex shaped article which includes a plurality of shaped portions, and wherein expanding further comprises forming the complex shaped article.

103 62. (original) The method of claim 52, wherein the bladder is comprised of rubber, and wherein expanding comprises expanding the rubber bladder.

103 63. (original) The method of claim 52, wherein the bladder is comprised of polyurethane, and wherein expanding comprises expanding the polyurethane bladder.

1 12
64. (currently amended) The method of claim 55, wherein the pumping enabling element ~~means~~ includes a tube, adapted to be connected to the flexible member, and wherein expanding comprises enabling the pressure-exerting medium to be pumped through the tube into the flexible member.

103
+reat 65. (original) The method of claim 55, wherein the pressure-exerting medium comprises hydraulic fluid, and wherein expanding comprises enabling hydraulic fluid to be pumped through the pumping enabling means into the flexible member for expansion of the flexible member.

103 66. (currently amended) The system of claim 56, wherein the unheated sheet metal blank is comprised of aluminum, and wherein expanding comprises expanding the flexible member against the unheated aluminum blank.

67. (original) The method of claim 58, wherein the article comprises an aircraft fuselage crown frame, and wherein expanding further comprises forming the aircraft fuselage crown frame.

103 68. (original) The method of claim 58, wherein the article to be formed thereby further comprises a thin-walled article, and wherein expanding further comprises forming the thin-walled article.

69. (original) The method of claim 58, wherein the article to be formed thereby further comprises a structural article, and wherein expanding further comprises forming the structural article.

a 70. (currently amended) The method of claim 58, wherein the unheated blank to be formed into the article is substantially large corresponding to the substantially large article, and wherein expanding further comprises exerting pressure on the substantially large unheated blank.

It treat 71. (currently amended) The method of claim 58, wherein the enclosing enabling element means, the form-shaping element, and the flexible member are substantially large corresponding to the substantially large article, and wherein opening further comprises opening the substantially large enclosing enabling element means and positioning the unheated blank relative to the substantially large form-shaping element, and expanding further comprises expanding the substantially large flexible member.

72. (original) The method of claim 64, wherein the tube comprises a flexible

~~is~~
Inherent
It tube, and expanding comprises enabling the pressure-exerting medium to be pumped through the flexible tube.

a 73. (new) A method of bulge forming an unheated substantially flat blank into an article which comprises a formed part and which includes a shaped portion, in a system which comprises form-shaping means for enabling the shaped portions of the article to be formed thereagainst, including a complementary portion which is complementary in shape to the shape of the shaped portion of the article to be formed thereby, enclosing enabling means for enabling the form-shaping means to be enclosed therein, and for enabling the unheated blank to be positioned and enclosed therein, a flexible member, adapted to be enclosed within the enclosing enabling means, to bulge within the enclosing enabling means upon the application of pressure to the flexible member, to exert pressure on the unheated blank adapted to be positioned in the enclosing enabling means, and to bend the unheated blank relative to the form-shaping element complementary portions to form the shaped portion of the article, and expansion enabling means for enabling expansion of the flexible member so as to exert pressure on the unheated blank and form the shaped portion of the article against the form-shaping means, wherein the method comprises:

opening the enclosing enabling means and positioning the unheated blank therein relative to the form-shaping means;

closing the enclosing enabling means; and

expanding the flexible member such that the flexible member bulges

It relative to the unheated blank and exerts pressure on the unheated blank against the form-shaping means to form the shaped portion of the article.

It
treat 74. (new) The system of claim 7, wherein the pressure exerting medium is adapted to exert substantially high pressure.
